Manitoba

ANNUAL REPORT

1985

Dairy Laboratory Quality Testing Summary

87-03651/

F O R E W O R D

The following report contains the annual summary of test results of the Dairy Laboratory of the Animal Industry Branch, Manitoba Agriculture. The Laboratory is located at the Agricultural Services Complex, University of Manitoba, Winnipeg.

Samples analysed at the laboratory continue to provide information on dairy products and milk samples for quality control, health requirements, payment to producers, milk recording information and extension activities within the dairy industry. The analyses performed to provide this information cover a variety of test procedures. The 1985 data is summarized in the tables included in this report.

Tests performed on raw milk bulk tank samples include: fat, protein, lactose, antibiotics, added water and somatic cell counts. In addition fat, protein and lactose determinations are made for the D.H.I.A. and Owner Sampler programs. Pasteurized products are tested by Standard Plate Count, Coliform count, phosphatase test, added water in homogenized, 2%, and skim milk and keeping quality tests on pasteurized milk. Butter samples are monitored for yeasts, moulds, and proteolytic bacteria. Cheddar cheese samples are tested for coliform bacteria, E. coli, Staphylococcus aureus and Salmonella.

Due to the integration of the D.H.I.A. program into Central testing and the significant growth in this program, a considerable increase in work load was experienced in the milk composition unit of the Dairy Laboratory. This integration was completed in 1980. To handle this additional sample load a second Milkoscan 203 was put in line. Information on Butterfat-protein inversions continues to be available to extension personnel as an aid in correcting the problems of feeding and herd management.

All tests for payment purposes for the Manitoba Milk Producers' Marketing Board continue to be done weekly by the Milkoscan 203, on fresh milk samples. These weekly test results are transmitted to the Marketing Board via computer interchange. The butterfat results are used to determine the payment for milk from producers. Protein and lactose results continue to be entered in the computer storage tape for possible future use.

Two Hewlett Packard 85 instrument controllers are interfaced with both Milkoscan 203's. This has practically eliminated the manual transfer of data. All producer test data from the Milkoscan is automatically recorded on tape and then transferred to the Milk Marketing Board Computer via telephone line.

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D A I R Y L A B O R A T O R Y F U N C T I O N S

The Dairy Laboratory is a central testing facility within the Dairy Section of the Animal Industry Branch, Manitoba Agriculture.

The basic functions of the laboratory are:

1) Testing of raw milk to insure that it meets the quality requirements as outlined in the Dairy Act.

2) Testing of pasteurized dairy products to insure that all safeguards are met and to provide information on keeping quality estimation.

3) Testing of pasteurized dairy products to insure that all composition parameters are maintained.

4) Testing for butterfat and other components as a basis of payment to milk producers.

5) Milk Composition testing for Dairy Herd Improvement Associations and Owner Sampler Milk Recording programs.

6) Assistance to field staff and industry in solving quality problems.

SAMPLING

1) The procedure in use for raw milk, involves the aseptic collection of a universal milk sample that can be used for both bacteriological and compositional analysis. Each milk shipper is supplied with sterile "whirl pak" plastic bags, identified with his name and number. These bags are used for representative sampling by the Bulk Milk Grader at each Bulk Milk pick-up. The milk samples so collected are stored in an refrigerated storage at the dairy plant prior to delivery to the laboratory. All samples are delivered to the dairy laboratory within 48 hours of pick-up and must arrive at a temperature below 5^{o}C.

2) Sampling and testing of all pasteurized fluid products is done not less than once per week. The products include cottage cheese, sour cream, cream cheese spread, as well as fluid milk products. Butter and cheddar cheese samples for bacteriological examination are taken not less than once per month from all manufacturing plants in province.

ARTEK AUTOMATIC COLONY COUNTER
Used for counting of Standard Plate Counts and Plate Loop Counts on raw and pasteurized milk samples

Plate loop counts are done for each milk producer once per month to insure that bacteriological standard for acceptable milk of "not more than 75,000 per ml" is maintained. It is generally agreed that if milk has been produced and handled properly there should be no difficulty in maintaining a bacteria count of less than 75,000 per ml. In fact, over 88% of the producer samples have counts of less than 50,000 (Table 1). Since most of the bacteria present in raw milk produce enzymes capable of producing defects in the pasteurized product their numbers should be low to insure that the final product is of good quality.

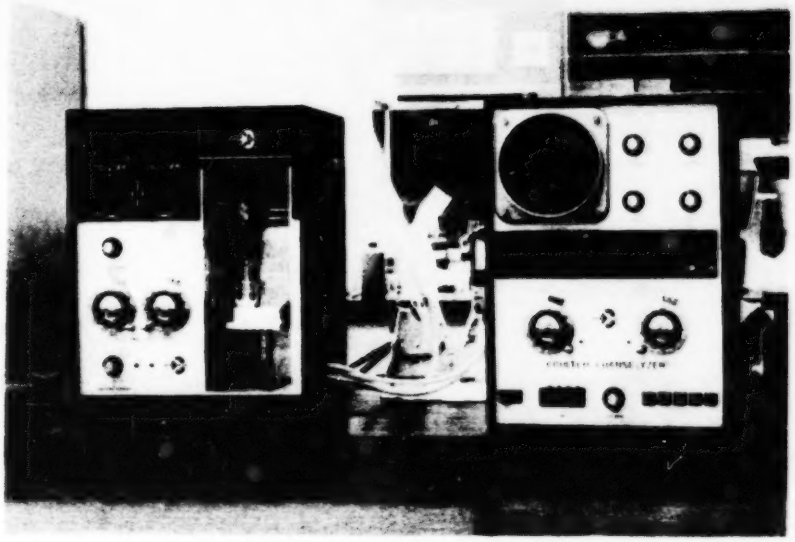
TABLE 1

R A W M I L K Q U A L I T Y - 1 9 8 5

PLATE LOOP COUNTS
(counts per ml)

Month	Producer Samples	<50,000	Percent <50,000	50,000 to 75,000	Percent 50-75,000	<75,000	Percent <75,000	>75,000	Percent >75,000	Plate Loop Samples
January	1148	982	85.5	120	10.4	1106	96.3	42	3.9	1526
February	1144	998	87.2	104	9.1	1104	96.5	40	3.5	1453
March	1144	1033	90.2	91	8.0	1122	98.1	22	1.9	1402
April	1143	1047	91.6	76	6.6	1123	98.3	20	1.7	1565
May	1129	1034	91.6	71	6.3	1107	98.0	22	1.9	1388
June	1120	991	88.5	104	9.3	1098	98.0	22	1.9	1430
July	1127	985	87.4	97	8.6	1091	96.8	36	3.1	1455
August	1147	995	86.7	91	7.9	1113	97.0	34	2.9	1430
September	1132	953	84.2	97	8.6	1097	96.9	35	3.1	1489
October	1121	1025	91.4	74	6.6	1102	98.3	19	1.7	1373
November	1128	998	88.5	95	8.4	1101	97.6	27	2.4	1363
December	1119	995	89.1	77	6.9	1074	95.9	45	4.0	1377
YEARLY TOTAL	13,602	12,037	88.5	1,097	8.1	13,238	97.3	364	2.7	17,251

S O M A T I C C E L L C O U N T S



COULTER COUNTER AND COULTER CHANNELYZER
The Coulter Counter is used electronically counting somatic cells in milk. Coulter Channelyzer is used to determine the range of Somatic Cell sizes in the milk sample.

Somatic cell counts are done on all milk producer samples each month. Cell numbers are reported on a per millilitre basis and include all types of cells present in the milk. The presence of mastitis infection is the principle factor in causing an elevated cell count. However, temporary high cell counts may be due to such factors as: mechanical injury to the cow, stage of lactation, or other "stress" factors. Research in this area indicates that herd cell counts over 500,000 results in altered milk composition, flavour defects, decreased milk production in the herd, and lower yields for the cheese industry.

The farm Services staff are available to provide special assistance to milk producers, that encounter a consistently high cell count. One important first step is to analyze the milking equipment and milking methods. After recommended corrections have been made the herd may be quarter sampled and these samples used to determine which quarters in the herd are causing the problem. The producer will then in consultation with his Veterinarian determine the action to be taken to correct the problem.

TABLE 2

S O M A T I C C E L L C O U N T S - 1 9 8 5

(counts per ml)
(m= million)

Month	Producers Tested	<500,000	%	500 to 1m	%	1m to 1.4m	%	1.5m to >	%
January	1136	548	48.2	480	42.3	77	6.8	31	2.7
February	1150	564	49.0	436	37.9	114	9.9	36	3.1
March	1141	537	47.1	470	41.2	104	9.1	30	2.6
April	1157	549	47.4	495	42.8	79	6.8	34	2.9
May	1117	530	47.4	496	44.4	75	6.7	16	1.4
June	1152	564	48.9	506	43.9	62	5.4	18	1.6
July	1116	477	42.7	511	45.8	98	8.8	30	2.7
August	1126	348	30.9	591	52.5	148	13.1	39	4.5
September	1033	403	39.0	509	49.2	90	8.7	31	3.0
October	1112	561	50.4	449	40.4	75	6.7	27	2.4
November	1164	519	44.6	523	44.9	93	7.9	29	2.5
December	1073	449	41.8	460	42.8	116	10.8	48	4.5
TOTAL	13477	6049	44.9	5626	41.7	1131	8.4	369	2.7

<500,000	6049	44.9%
500,000 to 1m	5626	41.7%
1.0 to 1.4m	1131	8.4%
1.5m or more	369	2.7%

TABLE 3

MEAN CELL COUNTS ON HERD BULK MILK - COULTER COUNTER

(counts per ml)

Month	1979	1980	1981	1982	1983	1984	1985
January	684,000	738,000	744,000	544,000	572,000	540,000	586,000
February	600,000	720,000	814,000	579,000	532,000	519,000	602,000
March	647,000	744,000	696,000	625,000	477,000	540,000	595,000
April	622,000	781,000	629,000	542,000	550,000	539,000	589,000
May	600,000	805,000	612,000	688,000	503,000	536,000	575,000
June	660,000	750,000	626,000	620,000	522,000	524,000	555,000
July	724,000	840,000	622,000	625,000	632,000	610,000	623,000
August	842,000	970,000	561,000	718,000	700,000	710,000	699,000
September	899,000	828,000	571,000	658,000	641,000	580,000	652,000
October	777,000	757,000	520,000	689,000	691,000	562,000	576,000
November	811,000	735,000	510,000	634,000	618,000	556,000	611,000
December	766,000	718,000	540,000	594,000	638,000	570,000	656,000
AVERAGE	748,000	778,000	629,000	625,000	576,000	566,000	610,000

ANTIBIOTIC TESTING PROGRAM

In all milk markets the presence of detectable amounts of antibiotics in the milk supply is of concern for two reasons: (1) presence of many types of antibiotics in milk, may cause an allergic reaction in persons who are sensitive to them; (2) the presence of small amounts of antibiotics slows or stops the growth of the bacterial culture used in the milk for cultured products and cheese, resulting in loss of production and "dumping" of the milk.

The Dairy Laboratory monitors all shipper samples once per month using Bacillus subtilis disc assay, 1/2" disc, in addition all tank truck samples are screened using Bacillus stearothermophilus 1/2" disc assay on PMI agar. When a shipper sample is found to be "positive" for antibiotics, the producer, farm services inspector and hauler are notified for corrective action. As a result the producer receives a penalty deduction from the Milk Marketing Board. Also, shipments from the producer cannot be resumed until a negative test is obtained.

As of August 1, 1986, all shipper and truck samples will be tested using a quantitative Bacillus stearothermophilus 1/2" disc assay on PMI Agar.

TABLE 4

A N T I B I O T I C T E S T I N G P R O G R A M - 1 9 8 5

Month	Producers Tested	Total Tests Done	Producers Positive	Percent of Producers in Penalty
January	1160	1981	6	.52
February	1160	1916	9	.78
March	1148	1832	3	.26
April	1159	1913	4	.35
May	1129	1715	1	.09
June	1120	1727	3	.27
July	1127	1762	1	.09
August	1147	1756	3	.26
September	1132	1644	4	.35
October	1121	1851	1	.09
November	1120	1678	1	.09
December	1119	1778	5	.45
	13642	21562	42	

For the year there were .31% of the milk producers with positive antibiotics.
.19% of all samples tested were positive for antibiotics.

A D D E D W A T E R T E S T I N G P R O G R A M

4C11 CRYOSCOPE
For detection of added water in milk. Operates automatically including printouts of freezing points.

All milk producer and truck samples are monitored at least once per month. When a reading of $-0.524^{o}H$ or higher is obtained it is considered to be adulterated. The Marketing Board is notified and the producer is given a warning that any other violation in a twelve month period results in a cash penalty to the producer.

TABLE 5

C R Y O S C O P E - R A W M I L K - 1 9 8 5

Month	Producer Samples	-0.524° or Higher	Percent	Normal	Percent	Truck Samples	-0.524° or Higher	Percent	Total Cryoscopes
January	1170	4	.34	1166	99.7	122	0	0	1431
February	1138	5	.44	1133	99.6	130	0	0	1342
March	1144	4	.35	1140	99.7	130	0	0	1419
April	1143	3	.26	1140	99.7	124	0	0	1423
May	1129	4	.35	1125	99.6	123	0	0	1414
June	1175	7	.63	1168	99.4	119	0	0	1392
July	1131	12	1.1	1119	98.9	127	0	0	1422
August	1126	5	.49	1121	99.6	116	0	0	1405
September	1132	9	.80	1123	99.2	123	0	0	1347
October	1121	9	.80	1112	99.2	119	0	0	1403
November	1120	6	.53	1114	99.5	123	1	.8	1398
December	1110	10	.90	1100	99.1	126	0	0	1351
TOTAL	13639	78	.57	13561	99.4	1482	1	.06	16747

FINISHED PRODUCT TESTING

Bacteriological standards for processed and manufactured dairy products are set out by Regulation. These include Standard Plate Counts and Coliform counts on fluid milk products, Coliform and Staphylococcus, and Salmonella Counts on cheddar and specialty cheese products. Butter is tested for yeast and mould counts and proteolytic bacteria counts.

The standard for non-cultured fluid milk products is "not more than 10 Coliforms per ml. The standard for butter is "not more than 10 yeast and moulds per gram". Products exceeding the standards are retested and if found to exceed the standard, the product is subject to recall from the market.

Testing for various bacteria in pasteurized dairy products is done to determine potential sanitary problems at the dairy plant. High bacteria counts in the packaged product is largely due to post pasteurization contamination. In addition, all pasteurized dairy products are tested for adequate pasteurization by the use of the phosphatase test. Products which have not been heated to pasteurization temperature for sufficient time, or have been contaminated with small amounts of raw milk, will fail the test. If a product gives a positive test it is subject to immediate recall from the market.

The Standard Plate Count and Coliform count are used as a measure on pastuerized fluid products of the sanitary handling of the milk at the dairy plant. The types of bacteria found in pasteurized milk are predominantly spoilage organisms and usually cause flavor defects. When there is a low bacteria count in the pasteurized milk usually it has a longer storage life and improved flavor and quality.

TABLE 6

F I N I S H E D P R O D U C T Q U A L I T Y 1 9 8 5

Product	Coliform Counts Number of Tests	Above 10/ml	% >10/ml	% Clear of Coliforms	Standard Plate Count Number of Tests	>20,000/ml	% >20,000/ml
Homo	531	12	2.3	90.9	529	0	0
Low Fat Homo	424	2	.5	92.2	421	0	0
Cereal Cream	370	1	.27	92.4	366	8	2.2
Whipping Cream	228	0	0	96.1	228	3	1.3
Chocolate Drink	243	2	.82	93.4	241	2	.8
Skim Milk	395	9	2.3	88.9	392	0	0
Ice Cream	176	17	9.7	74.4	173	2	1.2
Ice Cream Mix	144	5	3.5	88.9	140	2	1.4
Cottage Cheese	121	4	3.3	86.0			
Buttermilk	98	0	0	99.0			
Salad Cream	191	9	4.7	90.9			
TOTAL	2921	61	2.1		2661	17	.68

K E E P I N G Q U A L I T Y T E S T S

This program was continued in 1985 with 185 Homogenized Milk and 170 Low Fat 2% samples tested.

Many flavor defects in pasteurized products are due to bacterial growth during storage. Routine bacteria counts are done on freshly pasteurized product picked up at the Dairy Plant and are very low (less than 300 per ml), however, the maximum standard is 20,000/ml. These same samples, when held for 5 days at 7°C and then tested, may still have a low count or may have increased to 250,000 per ml or more. The bacteria count after storage is from bacteria which can grow at low temperatures and is indicative of the degree of contamination of the pasteurized product by psychrotrophic bacteria. If a processing plant produces low counts after storage (5 days at 7°C), shelf life and flavor quality is likely to be improved. The basis of the test is to detect potential spoilage bacteria which will shorten the shelf life of the pasteurized product. Note Table 7, none of the fresh samples tested were over 20,000 standard plate counts while 32.9 of samples tested after storage for 5 days at 7°C had counts of over 250,000 per ml.

C R Y O S C O P E O N P A S T E U R I Z E D P R O D U C T S

Under the Dairy Act, milk is considered adulterated if by the it is determined that there is "added water" in the product. The degree of adulteration is determined by measuring the freezing point of the milk, similar to the test used on raw milk. A freezing point of -0.524° or higher is considered to be adulterated and such products are subject to recall. Pasteurized products regularly tested are Homogenized Milk, 2% Homo and Skim Milk.

TABLE 7

K E E P I N G Q U A L I T Y T E S T S 1 9 8 5

(5 days @ 7°C then SPC)

PRODUCT	TOTAL	<50,000/ML	51-100,000/ML	101-250,000/ML	>250,000/ML
Homo	185	98 (52.9%)	7 (3.8%)	11 (5.9%)	69 (37.3%)
Low Fat Homo	170	100 (58.8%)	4 (2.4%)	10 (5.9%)	56 (32.9%)

Initial counts on all samples were less than 20,000.

P H O S P H A T A S E T E S T I N G

Products Tested: Homo, 2%, Skim, Cereal Cream, Whipping Cream, Ice Cream Mix, and Cottage Cheese

Total Number of Tests: 2047 All phosphatase tests less than 2.3 units.

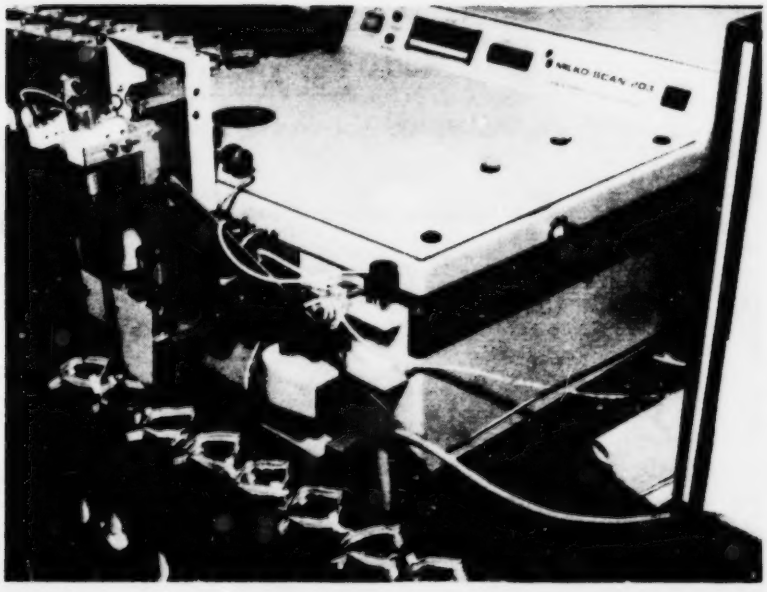
The phosphatase test is used to determine if a product has been properly pasteurized or if the pasteurized product has been recontaminated with raw product. The test measures residual phenol in the sample. Raw milk gives a high phenol reading while a pasteurized sample will give values of less than 2 ug of phenol equivalent per 0.5 ml of fluid dairy product; or for cheese, a reading of less than 2 ug of phenol equivalent per 0.25 gm. Results showing more than 2 ug are reported as positive phosphatase.

TABLE 8

C R Y O S C O P E
P A S T E U R I Z E D M I L K
1 9 8 5

Month	Total	Freezing Point -0.524° or Higher	Percent -0.524° or Higher
January	110	0	0
February	84	0	0
March	86	2	2.3
April	102	4	3.9
May	118	2	1.7
June	98	3	3.1
July	104	2	1.9
August	107	1	.93
September	92	2	2.2
October	99	1	1.0
November	91	1	1.1
December	115	0	0
TOTAL	1208	18	1.5

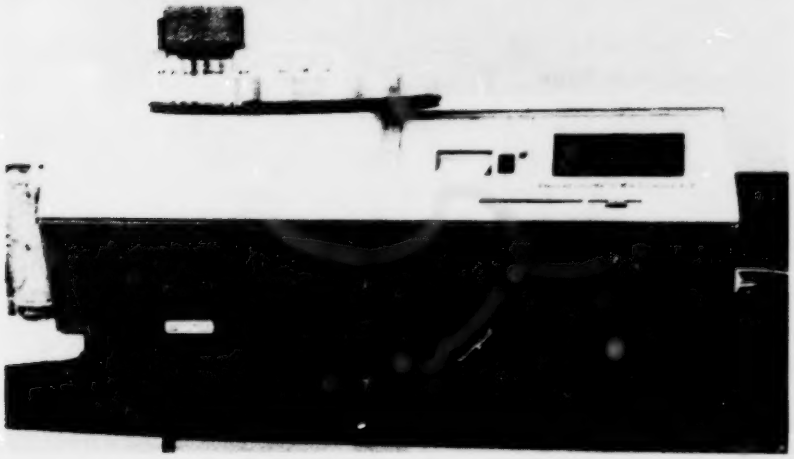
MILK COMPOSITION



MILKOSCAN 203
Tests for fat, protein and lactose by infrared.
This equipment can test up to 220 samples per hour.

Butterfat, protein and lactose is determined on raw milk samples for the Dairy Herd Improvement Association, Owner Sampler programs and the Manitoba Milk Producers' Marketing Board. The Manitoba Milk Producers' Marketing Board use the butterfat tests as a basis of payment with protein and lactose results being stored for future use. Table 12 gives a summary of the average monthly fat tests for 1984 and 1985. The average protein tests are included for the same period. Table 13 gives average lactose comparisons for 1984 and 1985.

Butterfat testing of pasteurized dairy products is done to determine if each product meets the legal standard for butterfat. The minimum butterfat content for each product is stated on the container. Dairy products are subject to recall by the dairy plant if three consecutive tests are outside the acceptable limit.



HEWLETT PACKARD 85 CONTROLLER

TABLE 9

TESTS PERFORMED IN MILK COMPOSITION LAB FOR THE YEAR 1985

Month	Butterfat on Farm Tank Samples	Butterfat on DHIA	Butterfat on O/S	Total
January	5091	9780	3434	18305
February	5089	8786	2959	16834
March	5306	1047	3478	19254
April	4499	9013	3160	16672
May	5836	9810	2728	18374
June	5202	8059	2108	15369
July	5929	8177	2954	17060
August	4231	8384	2268	14883
September	5249	8483	2936	16668
October	5863	9477	3210	18550
November	4986	8664	2567	16217
December	4013	8213	2481	14707
TOTAL	61294	107316	34283	202893

In addition to the regular compositional tests on producer and DHIA samples, samples were also tested for the University of Manitoba Animal Science Department, Calibration Samples, Specials for commercial dairies and Farm Services, and inter-laboratory comparisons as follows:

January	1308
February	1084
March	1062
April	1095
May	1589
June	1106
July	1180
August	1200
September	948
October	714
November	1428
December	924
TOTAL	13638

Split samples were prepared and tested by the AOAC Mojonnier method and on both Milko Scan 203 machines. The numbers were as follows:

January	176
February	160
March	168
April	160
May	176
June	152
July	176
August	152
September	152
October	180
November	144
December	160
TOTAL	1956

TABLE 10

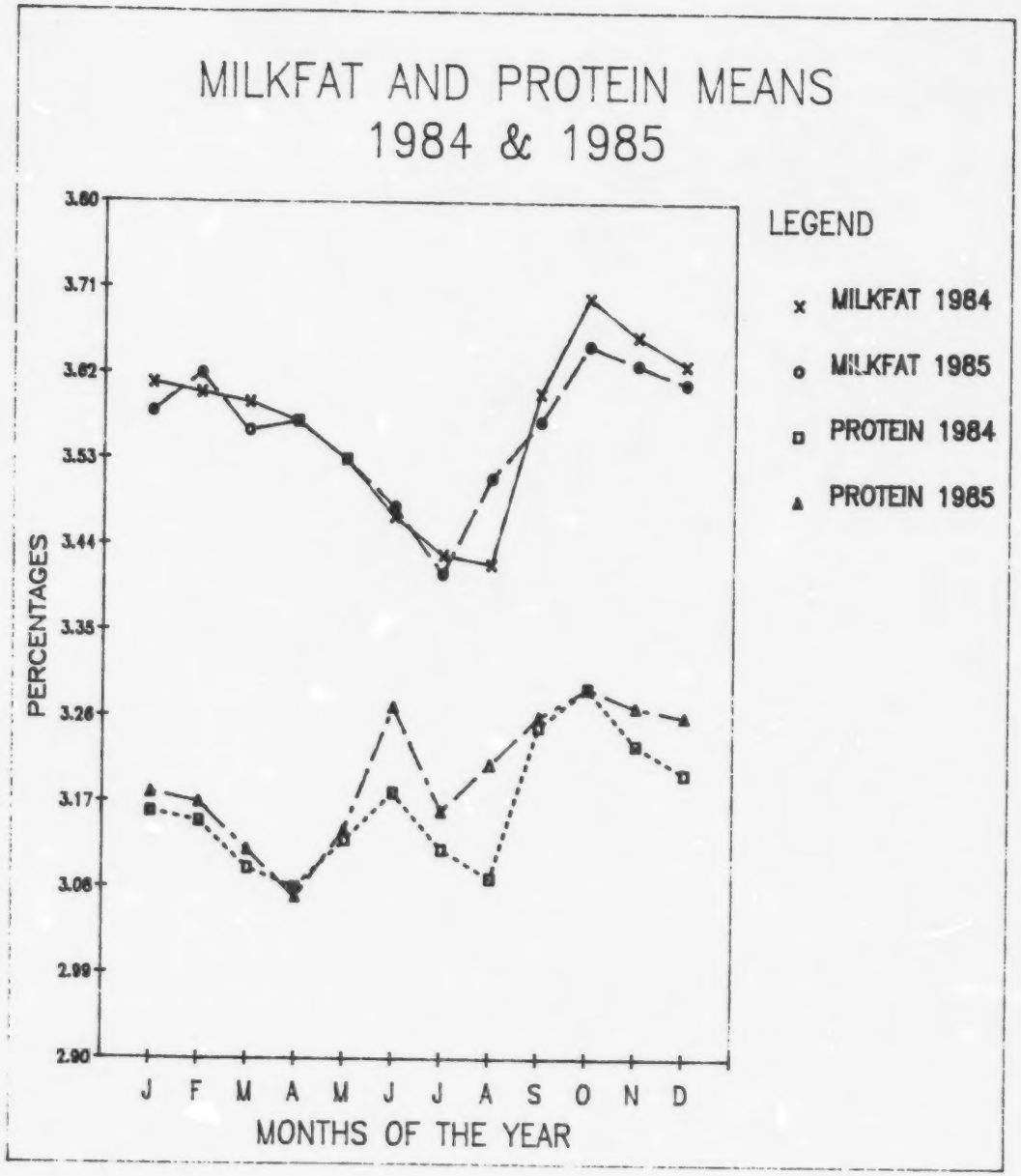
BUTTERFAT TESTS ON FINISHED PRODUCTS

Month	Total Tests	Outside Standard	Percent Outside Standard
January	217	23	10.6
February	211	9	4.3
March	224	19	8.5
April	212	27	12.7
May	244	22	9.0
June	199	16	8.0
July	207	12	5.8
August	200	11	5.5
September	142	18	12.7
October	213	13	6.1
November	223	9	4.0
December	181	9	5.0
TOTAL	2473	188	7.6

TABLE 11

TOTAL COUNT ON RAW MILK HELD AT MANITOBA PROCESSING PLANTS

Month	1984 Samples Tested	% >300,000	1985 Samples Tested	% >300,000
January	61	32.7	43	25.6
February	58	36.2	28	21.4
March	58	32.7	27	18.5
April	56	30.3	37	27.0
May	42	23.8	32	12.5
June	44	27.2	33	0
July	37	18.9	39	43.6
August	39	35.9	38	26.3
September	34	17.6	28	17.9
October	44	11.4	41	31.7
November	40	20.0	23	21.7
December	29	20.6	20	20.0
TOTAL	**542**	**AVERAGE 26.8%**	**TOTAL 389**	**AVERAGE 23.0**

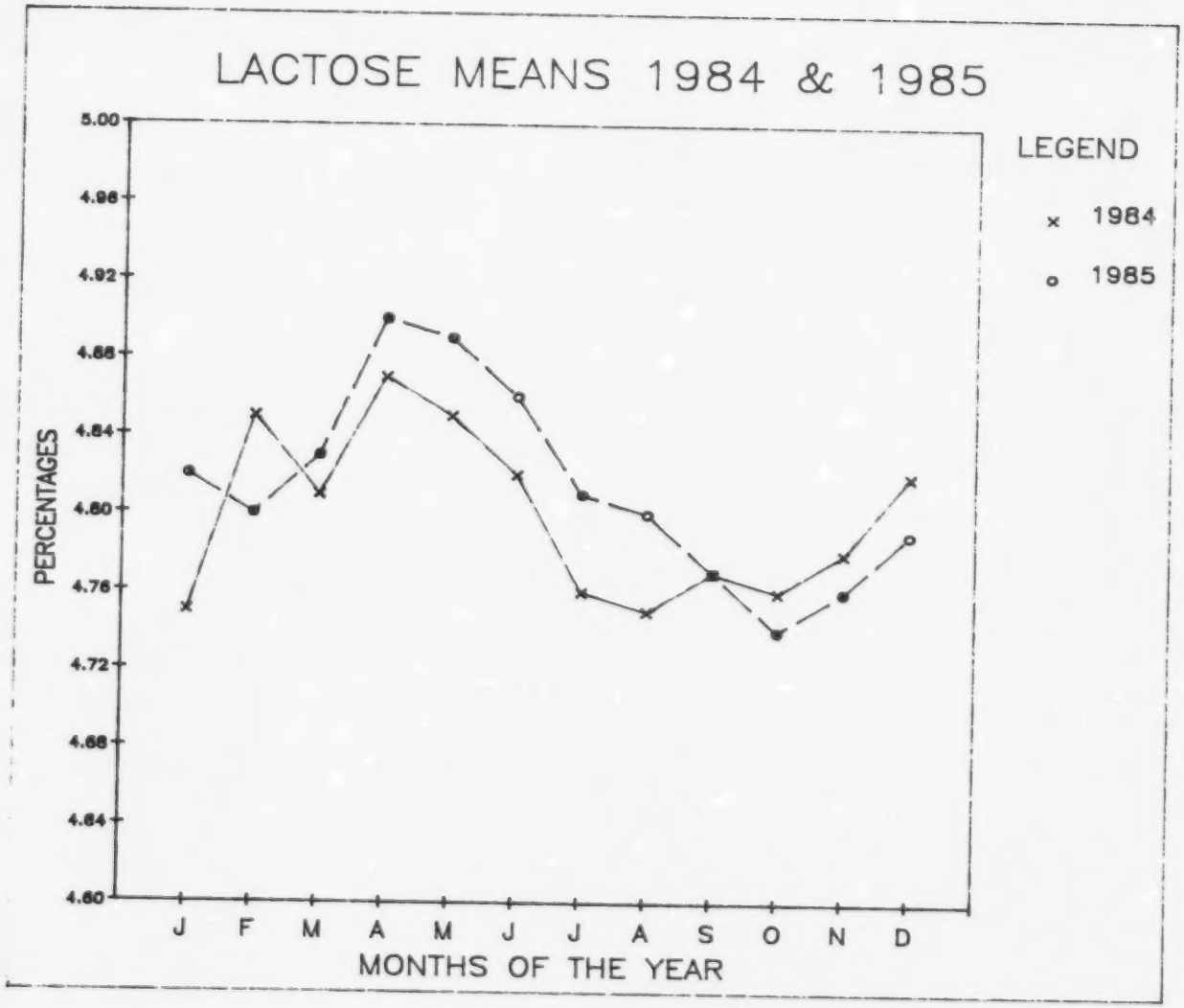


1984

	B.F.	Protein
J	3.61	3.16
F	3.60	3.15
M	3.59	3.10
A	3.57	3.08
M	3.53	3.13
J	3.47	3.18
J	3.43	3.12
A	3.42	3.09
S	3.60	3.25
O	3.70	3.29
N	3.66	3.23
D	3.63	3.20

1985

	B.F.	Protein
J	3.58	3.18
F	3.62	3.17
M	3.56	3.12
A	3.57	3.07
M	3.53	3.14
J	3.48	3.27
J	3.41	3.16
A	3.51	3.21
S	3.57	3.26
O	3.65	3.29
N	3.63	3.27
D	3.61	3.26



	1984
J	4.75
F	4.85
M	4.81
A	4.87
M	4.85
J	4.82
J	4.76
A	4.75
S	4.77
O	4.76
N	4.78
D	4.82

	1985
J	4.82
F	4.80
M	4.83
A	4.90
M	4.89
J	4.86
J	4.81
A	4.80
S	4.77
O	4.74
N	4.76
D	4.79